Geochemical and Geochronological Constraints on the Origin and Emplacement of the East Taiwan Ophiolite: Implication for Subduction Initiation of the South China Sea.

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The East Taiwan Ophiolite (ETO) occurs as blocks and thrust sheets associated with the Lichi Mélange in the Coastal Range of eastern Taiwan. The blocks consist of serpentinized harzburgite, serpentinite breccia, gabbro, dikes of dolerite and plagiogranite, pillow basalts, and red clay within a mud- and serpentinite-rich mélange matrix. New U-Pb zircon dating of a pegmatite gabbro yields a weighted mean age of 16.65±0.20 Ma. This age is earlier than the North Luzon Arc, but overlaps with the late–stage spreading of the South China Sea. ETO glassy basalt has low K_2O, MgO and high CaO contents, similar to MORB. REE and trace element patterns show both N-MORB patterns with LREE depletion and E-MORB patterns with slight LREE enrichment. A few samples show slight depletion in Nb-Ta, and Ti and enrichment in Rb, Ba, U and Sr, indicating a hint of subduction influence. Most ETO basalt plots within the overlapping fields of N-MORB and BABB on Ti-V, Cr-Y, Nb/Yb- Th/Yb and Hf/3-Th-Ta discrimination diagrams. The geochemical compositions of the ETO basalt are emblematic of mid-ocean ridge or back-arc lava, and the Pb isotope values are similar to those of MORB of the South China Sea from IODP Expedition 349. We interpret ETO basalt as fragments of the subducted South China Sea basement that were scrapped off and accreted to the Luzon forearc during the process of subduction initiation along the nascent Manila Trench. Blocks of mantle material in the mélange may originate from the upper plate of the arc-continent collision and were mixed with lower plate crustal material in a subduction channel now represented by the Lichi Mélange.

Keywords: East Taiwan Ophiolite, Lichi Mélange, South China Sea, back-arc basin, subduction initiation, arc-continent collision

